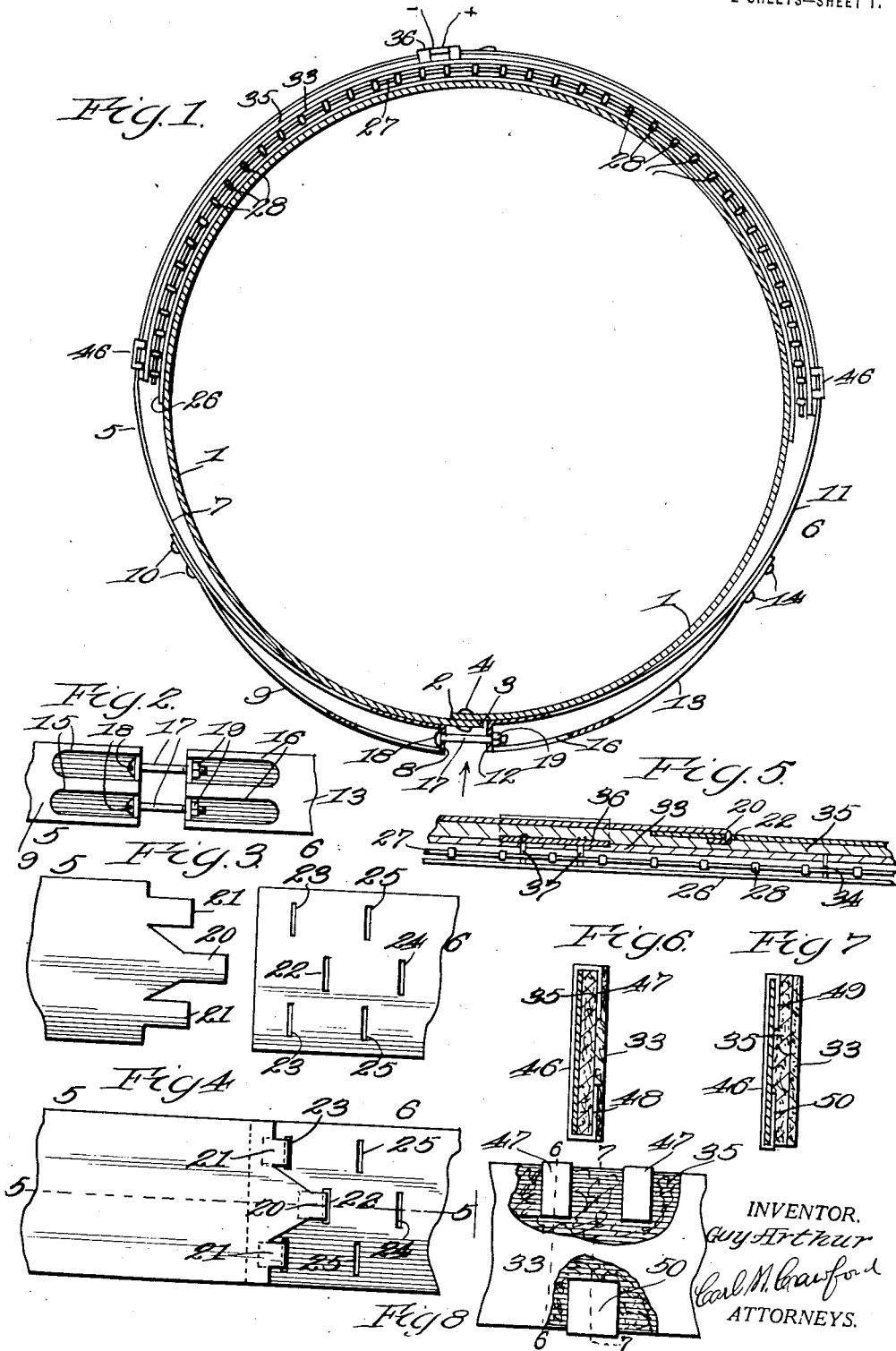


1,301,995.

Patented Apr. 29, 1919.
2 SHEETS—SHEET 1.

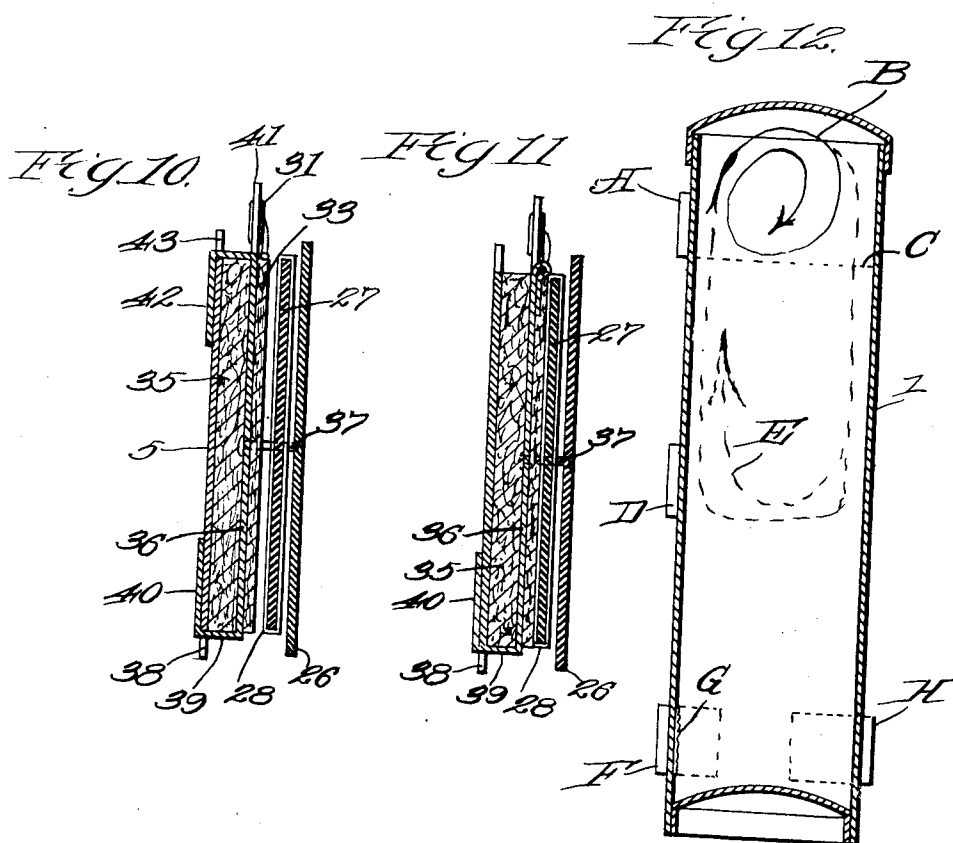
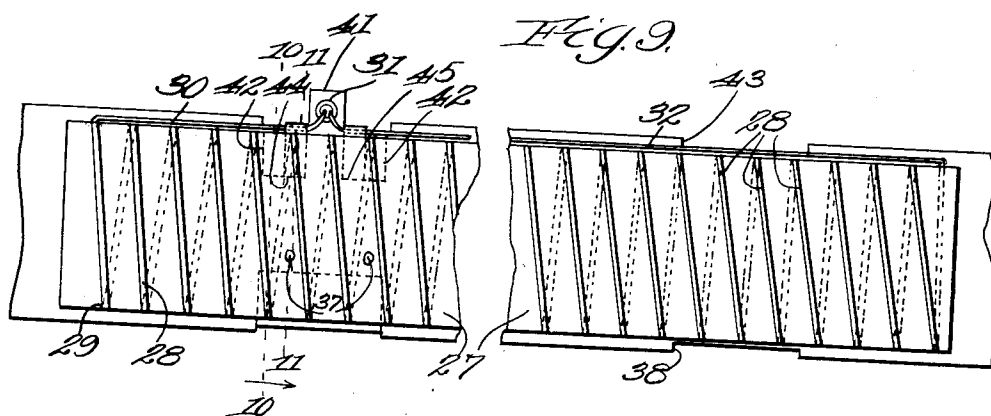


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ELECTRIC WATER HEATER.
APPLICATION FILED NOV. 4, 1916.

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2 SHEETS—SHEET 2.



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ELECTRIC WATER-HEATER.

1,301,995.

Specification of Letters Patent.

Patented Apr. 29, 1919.

Application filed November 4, 1916. Serial No. 129,485.

To all whom it may concern:

Be it known that I, GUY ARTHUR, a citizen of the United States, residing at Ritzville, in the county of Adams and State of Washington, have invented new and useful Improvements in Electric Water-Heaters, of which the following is a specification.

This invention relates to improvements in water heaters and is especially designed for use in connection with hot water tanks for supplying hot water for bathing and washing purposes.

The invention relates to improvements in that class of water heaters which are not only electrically operated but which are adapted to be applied externally on the tank.

Within the foregoing scope, it is a feature of my invention to employ an electric heater device which is adapted to extend about the periphery of the tank to an extent less than the total circumference thereof, means being employed for not only attaching said heater device at any desired elevation along the tank, but also, at any desired circumferential position with respect to the tank. By this means, I am able to attach the heater to the tank irrespective of any difficulties of inaccessibility which may result from location of a tank in a corner, or in such proximity to the stove and piping as would render it otherwise inaccessible for the attachment of such a device. Furthermore, the application of heat to a portion of the circumference of the tank serves to set up or initiate cycles of heat circulation of the contents in such a manner as not to appreciably affect that portion of the contents below the heater as would be the case if the heater extended completely about the circumference of the tank, that portion of the contents above the heater being of course raised to a higher temperature. By this means, I am able to quickly heat a small portion of the contents of the tank where the full volume is not desired. Because of the adjustability of the heater device circumferentially of the tank, I am able to free the sediment that would otherwise accumulate if heat were always applied to one portion of the tank.

A further feature of my invention resides in a novel means for attaching the heater to the tank, said novel means comprising a band between which and the tank the heater device is interposed, and along which the

heater device is adjustable circumferentially of the tank independently of any adjustment of the band.

My invention is particularly designed for application to water heating tanks which have a riveted seam extending vertically thereof, this type of tank being almost universally used at the present time.

In the employment of a band for applying the heater to the periphery of the tank, and because of the fact that the rivets protrude, and likewise the lap of the seam, it is essential to avoid loss of contact at the seam line point, as otherwise, the heater device would not be efficient. In accordance with my novel structure, a coupling device is employed for spanning the rivet seam so that portions of the band extending in opposite directions from the seam will be held in tight engagement against the tank. Now this feature, in combination with the feature of the circumferentially adjustable heater device, provides means whereby the band may always be located in predetermined relation with the rivet seam but the heater device may be circumferentially adjusted to that position which will permit of wiring connection, or to different circumferential positions which will free or precipitate the sediment accumulation.

Water heating tanks of this character are made in different sizes and this involves different diameter dimensions, and therefore it is a feature of my invention to provide a single type of device which may be adjusted to fit the stock sizes of all tanks now put on the market. Thus my invention involves the novel feature of providing a band which may be always coupled together in spanning relation to the rivet seam and which may also be lengthened or shortened in accordance with the diameter of tanks to which it is applied.

My invention has many other features and objects which will be more fully described in connection with the accompanying drawings and which will be more particularly pointed out in and by the appended claims.

In the drawings:—

Figure 1 is a horizontal sectional view of a water heating tank showing a device of my invention applied thereto.

Fig. 2 is a face view of my novel coupling located adjacent the rivet seam.

Fig. 3 is an enlarged face view of that

portion of the band diametrically opposite the coupled ends shown in Fig. 2, illustrating the manner in which the band may be lengthened or shortened to fit tanks of different diameter, the adjustable terminals being unconnected.

Fig. 4 is a view similar to Fig. 3 showing the adjustable ends connected to provide a band of the maximum length.

Fig. 5 is a sectional view on line 5—5 of Fig. 4.

Fig. 6 is a sectional view on line 6—6 of Fig. 8 showing a portion of the band and the manner in which a part of the insulation is connected therewith.

Fig. 7 is a sectional view on line 7—7 of Fig. 8.

Fig. 8 is an inside view of the band with portions of the insulation broken away to show the manner in which it is secured to the band.

Fig. 9 is an inside view of that portion of the band structure including the heating coil device.

Fig. 10 is a sectional view on line 10—10 of Fig. 9.

Fig. 11 is a sectional view on line 11—11 of Fig. 9.

Fig. 12 is a sectional view of a water tank showing the device of my invention applied thereto and illustrating, diagrammatically, the cycles of water circulation set up or initiated as a result of the application of the heater to only a circumferential portion of the tank.

Like characters of reference designate similar parts throughout the different figures of the drawings.

As illustrated, 1 designates a water tank having its margins 2 and 3 arranged in lapped joint relation and secured by a line of rivets 4. My improved device includes a band which is composed of two sections, one section being indicated at 5 and the other section indicated at 6. Said band may be in the form of an initially flat strip of metal and at the rivet seam, I provide the band sections with coupling terminals or ends which I will now describe in detail with reference to Figs. 1 and 2.

In view of the fact that both sections are identical in formation, as regards their coupling terminals, only one need be described in detail. Section broadly indicated at 5, has an intermediate portion 7 which is adapted to extend along the periphery of the tank 1 and is bent up to form a terminal 8. The remainder of the part 7 is bent back, as indicated at 9, and is secured at 10 to part 7 by rivets. Thus this bent back part will not only strengthen the band section itself but stiffen and support the terminal 8. Section 6 has corresponding parts 11, 12, 13 and 14. Adjacent terminal 8, the bent back end 9 is provided with slots 15,

and corresponding slots 16 are formed in the bent back portion 13. These slots provide for insertion of stove bolts 17, there being two in number, and the slots also provide for manipulating the heads 18 and nuts 19, by suitable implements, to tighten the band.

From the foregoing description it will be seen that I have provided coupling means which not only spans the rivet seam but which also holds the band in tight relation against the tank.

Reference will next be made to that feature of my invention whereby the band may be lengthened or shortened to fit tanks of different diameter.

Referring to Figs. 3 and 4, it will be seen that section 5 is provided with tongues 20 and 21, the central tongue 20 being longitudinally advanced and projecting beyond the lateral or side tongues 21. Section 6 is provided with sets of slots 22 and 23, and a set designated at 24 and 25, the slots 22 and 24 being disposed with respect to the slots 23 and 25 in a relation similar to the relation or disposition of the tongue 20 to the tongues 21. In Fig. 4, I have shown the manner in which the adjusting terminals are connected together, section 5 overlapping section 6 and the tongues 20 and 21 being inserted through slots 22 and 23 and folded back against section 6, as also illustrated in Fig. 5. The connection shown in Fig. 4 is that which will be made to impart to the band its greatest length. If the tongues 20 and 21 were inserted in slots 24 and 25, the band would have a shorter length and the section 6 may have as many sets of slots as desired. An important feature of this part of the structure is that I avoid rivets or any threaded connection and thereby provide a band which can be stamped out of sheet metal. It will be understood that after a heating device has been applied to a tank of a given size, it will not be necessary to subsequently disturb the adjusting connection made, and therefore, the tongues 20 and 21 will not be subjected to such frequent bending stress as would tend to break and weaken the metal thereof. Furthermore, it will be seen that the tongues are bent inwardly and are held in tight relation against the heater insulation, as shown in Fig. 5, so that tension stress cannot act to separate the tongue from the locked connection shown.

Reference will next be made to my improved heating device which is held in contact with the periphery of the tank throughout a portion of the circumference of the latter.

That portion of the heating device which directly engages the tank comprises a strip of insulation, which may be mica, and which is indicated at 26. Next outermost from the

mica 26, is a coil core of insulating material, such as mica, and indicated at 27, which is also a flat strip of material. The coil core will be appreciably the same length as the tank engaging insulation 26. Wound around the coil core 26 is the heating coil 28 and I preferably notch the margins of the core 27, as indicated at 29, so that the convolutions of the heating coil 28 will be flush with the edges of the core 27. One end of the heating coil, as indicated at 30, extends along the top of the heating device toward a connection which I will indicate broadly as 31, and which I have not shown in detail, but the same in practice will be of any suitable character to facilitate connection of supply wires. The remaining end 32, of the heating coil, extends toward the connection 31, as indicated more particularly at 39. On the outer side of the heating coil is disposed a strip of insulating material having as a primary purpose the retention or insulation against radiation outwardly of the heat from the coil, the same also acting to electrically insulate the coil from metallic parts of the band, this strip being preferably of asbestos and being indicated at 33.

The foregoing comprises the heating device or element *per se*, and these parts are suitably coupled together by any desired means such for instance as rivets 34 distributed at suitable distances lengthwise of the device. By reference to Fig. 1, it will be seen that this device peripherally engages the tank throughout a distance less than the circumference of the tank.

Interposed between the band and the heating device is a foundation strip of insulating material, such as asbestos, and which is indicated at 35.

It is a feature of this invention to adjustably mount the heating device on the band so that the heating device may be circumferentially adjusted lengthwise of the band to occupy any desired position on either side of the rivet seam. It is because of the fact the heater is shortened in length with respect to the circumference of the tank that I am able to realize this feature of adjusting the heater to any convenient circumferential position for installation, and also for the purpose of freeing sediment accumulations resulting from long usage of the heater against one portion of the tank.

As illustrated, 36 designates a clip which extends vertically along the outside face of insulation 33, said clip being fixed to the heating device by any suitable means such as rivets 37, which are shown extending through the clip 36, the outer insulation 33, the coil core 27 and the inner insulation 26. The band sections 5 and 6 are somewhat wider than the heating device and said band sections may be provided on their lower mar-

gins with a plurality of notches 38. One end of the clip 36 is bent beneath the foundation insulation 35, as indicated at 39, and said end is bent back against the outside face of the band, as indicated at 40, the slot 38 accommodating the end 40. The upper end of clip 36 is sub-divided to provide a support, upstanding, for the connection 31, two outside clips 42 which are bent back through upper notches 43 and against the band, and finally, ends 44 and 45 which are bent over the terminals 30 and 32, to hold the same in position. As illustrated more clearly in Fig. 11, the extreme ends of the parts 44 and 45 extend down between insulation 33 and the body 36 of the clip. Thus it may be seen that all of the wiring is mounted upon the heating device and therefore the heating device may be circumferentially adjusted along the band, and about the tank, to engage different circumferential areas of the latter, this being possible without disturbing the wiring connections.

I will next describe the manner in which the foundation asbestos 35 is mounted upon the band sections, independently of the heating element, but in such a manner that it may be readily adjusted when the heating element is adjusted so as always to provide the required insulation backing between the heating element and the band, irrespective of the position of the former, on the latter.

Referring now to Figs. 6, 7, and 8, 46 designates a clip which extends vertically outside of the band and which is provided with divided end portions for coupling the clip to the band and also to the foundation insulation 35. Said clip 46 is provided above and below with clip ends 47 and 48 which embrace insulation 35, these clip ends being outside ends. Central clip ends 49 and 50 extend between the band and insulation 35. I will preferably dispose these foundation clips near the ends of insulation 35, a suitable number of clips 36 being also provided and being distributed as may be deemed necessary.

Suitable plug connection may be made between the heating device and any convenient lighting or wall socket for supplying current, but as this is an obvious expedient, it will not be further referred to.

I will next refer to Fig. 12 to illustrate the advantages of my improved heater.

If it is desired to only heat a limited quantity of water, then the heater will be disposed in position A. Now, because of the fact that the heater only extends about a portion of the circumference of the tank, there will be freedom for the contents when cycles of heating circulation are set up, as indicated at B. In other words, these cycles of heating movement will be free to complete revolutions of movement toward and away from that area of the tank which is subjected to

heat. This would not be true if the heater extended completely about the tank as in that case the path of circulation of the heated water would be annularly upwardly and then axially downwardly and the radial flow from the annular upward moving body of water toward the center of the tank would collide in such opposing relation as to rather restrict than promote free cycles of movement. This is especially important in view of the fact that it has been determined by experiment that a sufficient amount of heat can be applied by a segmental heater. Furthermore, when the heater is disposed in position A, that portion of the contents below line C will not be heated until after that portion above line C has been heated to a very high temperature. Position D would result in raising the temperature of a greater volume of the contents, as indicated by dotted line circulation E.

Assuming that the heater had been located at position F for a considerable time, then sediment accumulations might form as indicated at G, on the interior of the tank abreast of the location of the heater. It would merely be necessary to circumferentially adjust the heater to position H in order not only to free such sediment accumulations but also increase efficiency of the heater by obtaining heat transmission through an unobstructed portion of the tank and allowing the sediment G to be precipitated.

It is desirable to locate the coupling connection abreast of the rivet seam, as shown in Fig. 1, but in the event that the tank was in a corner and the seam portion was inaccessible, the coupling connection could be made at an accessible point of the tank's circumference and the segmental heater could be disposed far enough from the rivet seam so that the latter would not hold the heater out of contact with the tank, this advantage being the direct result of a segmental heater over an annular heater.

It is believed that the advantages and utility of my invention will be clearly understood from the foregoing description and while I have herein shown and described one specific form of my invention, I do not wish to be limited thereto except for such limitation as the claims may import.

I claim:

1. A heater for a cylindrical water tank comprising an electric heater of sufficient length to engage the periphery of the tank throughout a portion of the circumference thereof, a band embracing said tank and heater, said heater being slidably supported on the band to permit the heater to be shifted circumferentially about the tank independently of said band.

2. A heater for a rivet seamed water tank, comprising in combination, a band having terminal ends adapted to lie on opposite

sides of the rivet seams, an electric heater interposed between said band and tank at a point remote from said rivet seams, means spanning said seam and coupling said terminal ends to tightly grip the band and heater against the tank, and means for changing the length of said band for tanks of different diameter to permit of disposing said terminal ends on opposite sides of said seam irrespective of the size of tank, substantially as described.

3. A heater for a rivet seamed water tank comprising in combination, a band having terminal ends adapted to be disposed on opposite sides of the rivet seam, an electric heater of sufficient length to engage the periphery of the tank throughout a portion of the circumference thereof, said heater being interposed between said band and tank and being circumferentially adjustable along said band, and means spanning said rivet seams for connection with said terminal ends to tighten the band and hold said heater against said tank irrespective of the circumferential position of the heater with respect to said band, substantially as described.

4. An electric heater for water tanks comprising in combination, a segmental heater adapted for engagement with a portion of the circumference of the tank, and a band encircling the tank and having coupling means for tightening the band about the tank and said heater, and said band having a device for adjusting its length located opposite said coupling means, substantially as described.

5. An electric heater for water tanks comprising in combination, a heater adapted for engagement with a portion of the circumference of the tank, and a band formed in two sections for encircling the heater and tank, said sections having a tongue and slot adjustable terminals for adjusting the length of the band, and said sections having coupling terminals adapted to be united to tighten the band about the tank, substantially as described.

6. As a means for heating water in a tank, a sectoral electric heater adapted to engage the periphery of the tank throughout a portion of its circumference, a band engaging said heater throughout its length and embracing the tank to support the heater on the tank, and clip means slidably connecting said heater with said band, substantially as described.

7. As a means for heating water in a tank, a sectoral heater of sufficient length to engage the tank through a portion of the circumference thereof, a foundation segment of insulating material backing said heater, a band embracing the tank and said foundation segment to press the heater against the tank, clip means fixed to the heater and adjustably mounting the latter on said band, and clip

means connected with said foundation segments to adjustably support the same on said band, substantially as described.

8. As a means for heating water in a tank, a sectoral electric heater adapted to engage the periphery of the tank throughout a portion of the circumference thereof and composed of a tank engaging strip of insulating material, a heating coil disposed against said strip, a heat insulating strip disposed against said coil, a band for supporting said heater against the tank, clip means connected with said heater and adjustably mounting the heater on said band, said clip means having a projecting portion for supporting a terminal connection to said coil, substantially as described.

9. An electric heater of the class described comprising in combination, a strip-like coil core, a coil wound about said strip core, an inside strip of heat conducting and electrically insulating material on the inside of said coil, a strip of non-heat conducting material and electrically insulating material on the outside of said coil, a supporter secured to said strips and having a projecting portion for support of an electrical connection, terminal wires leading from said coil to said connection, and said supporter having means for holding said terminal wires in position, substantially as described.

10. An electric heater for a cylindrical water tank, comprising in combination, a flexible heating coil structure adapted to be flexed into peripheral engagement about the tank, a flexible band embracing the tank and coil structure and means for securing the band about the tank, said coil structure being centrally supported and slidably connected to the band to permit slight displacement of the ends of said coil structure with respect to said band as the latter is tensioned about the tank.

11. An electric heater for a cylindrical water tank, comprising in combination, a flexible heating coil structure adapted to be flexed into peripheral engagement about the tank, a flexible band embracing the tank and

coil structure and means for securing the band about the tank, said coil structure being slidably connected intermediate its ends to the band to permit slight displacement of the ends of said structure with respect to said band as the latter is tensioned about the tank.

12. An electric heater for a water tank comprising a coil structure, a band embracing said tank and coil structure, said coil structure being connected to and slidable on the band to permit a relative adjustment of the coil on the band, and means for tensioning the band about the tank.

13. An electric heater for cylindrical water tanks formed of rigid material, comprising in combination, a flexible heating coil structure adapted to be flexed into peripheral engagement about the tank, a flexible band for backing said coil structure, means securing said structure to said band between the ends of the former thereby leaving end portions of said structure free to slide with respect to said band when both are disposed about said tank, and means for tensioning said band to hold said structure tightly against said tank, substantially as described.

14. An electric heater for cylindrical water tanks formed of rigid material, comprising in combination, a flexible heating coil structure adapted to be flexed into peripheral engagement about the tank, a flexible band for backing said coil structure, means securing said structure to said band between the ends of the former thereby leaving the end portions of said structure free to slide with respect to said band when both are disposed about said tank, means slidably connecting end portions of said structure with said band to support said end portions on said band, and means for tensioning said band to hold said structure tightly against said tank, substantially as described.

In testimony that I claim the foregoing as my own, I hereby affix my signature.

GUY ARTHUR.